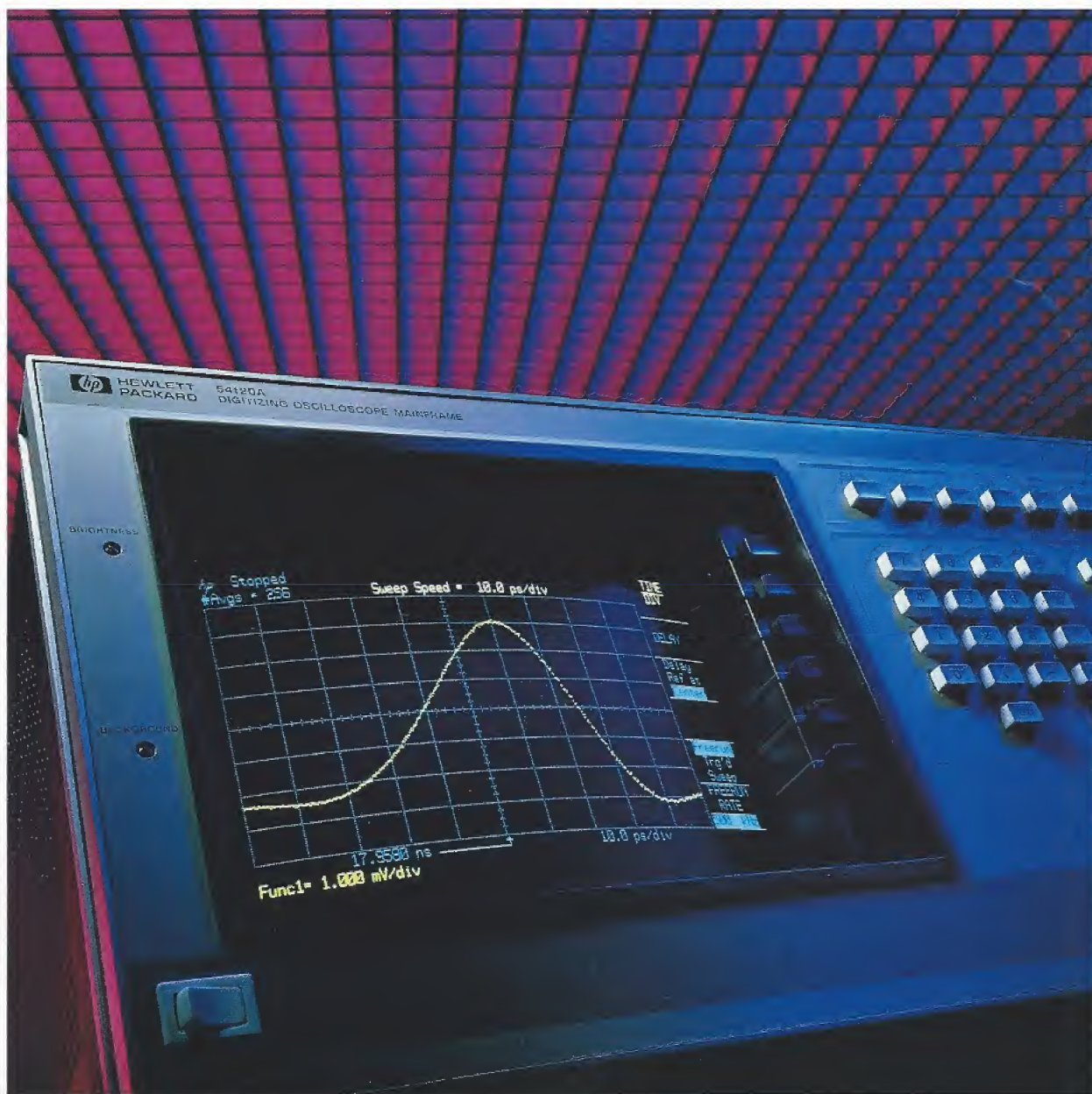


# TEST & MEASUREMENT

N E W S

HEWLETT-PACKARD

JULY/AUGUST 1987



HP 54120T Digitizing  
Oscilloscope

 **HEWLETT  
PACKARD**



## CONTENTS

## GENERAL-PURPOSE INSTRUMENTS

Universal counters offer more value **2**

More modules, software for HP PC Instruments **3**

New digitizing scope makes picosecond measurements **4**

New fiber-optic test instruments **5**

Low-priced, high-performance board test **6**

PC Instruments Application Handbook now available

New dc power-supply catalog Instrument Notes **7**

## RF &amp; MICROWAVE

New spectrum analyzer sweeps 100 Hz to 22 GHz **8**

Front panel and HP-IB control improves modular signal generator

New moderately priced microwave network-analyzer system **9**

Modular digitizer increases performance of HP 70000 system

New application note on low phase-noise signal generators **10**

On-site calibration of scalar network analyzers

RF/Microwave Notes

## COMPUTERS/CONTROLLERS

New tape drives unite high performance, compact design, low price **11**

Low-cost tablet supported by AutoCAD, VersaCAD

## MORE PRODUCTS

Seven more component families **12**

New digital-transmission tester for Bell network

## GENERAL-PURPOSE INSTRUMENTS

## Universal counters offer more value

New B versions of the HP 5316A and 5334A Universal Counters are available for 20% and 30% less, respectively. Frequency and time-measurement capabilities remain the same. In addition, the HP 5334B's optional 1.3-GHz C channel has dropped 25% in price.

For the budget-conscious ATE engineer, the HP 5316B has a full set of universal-counter capabilities with HP-IB (IEEE 488) standard. If you need the next step up in performance, the HP 5334B provides the high-resolution frequency and time measurements necessary for designing, building, and maintaining communications and navigation systems.

## Low-cost HP 5316B

The HP 5316B is a 100-MHz universal counter with a frequency range that can be extended through the RF bands to 1 GHz with an optional C channel. The HP 5316B provides a constant 7 digits/second of frequency or period resolution and has 10-ps time-interval average resolu-

tion (100-ns single-shot resolution).

Its standard HP-IB interface provides remote control of all measurement functions and the trigger-level and slope controls. For more measurement accuracy and longer intervals between calibrations, TCXO and oven-timebase options are available.

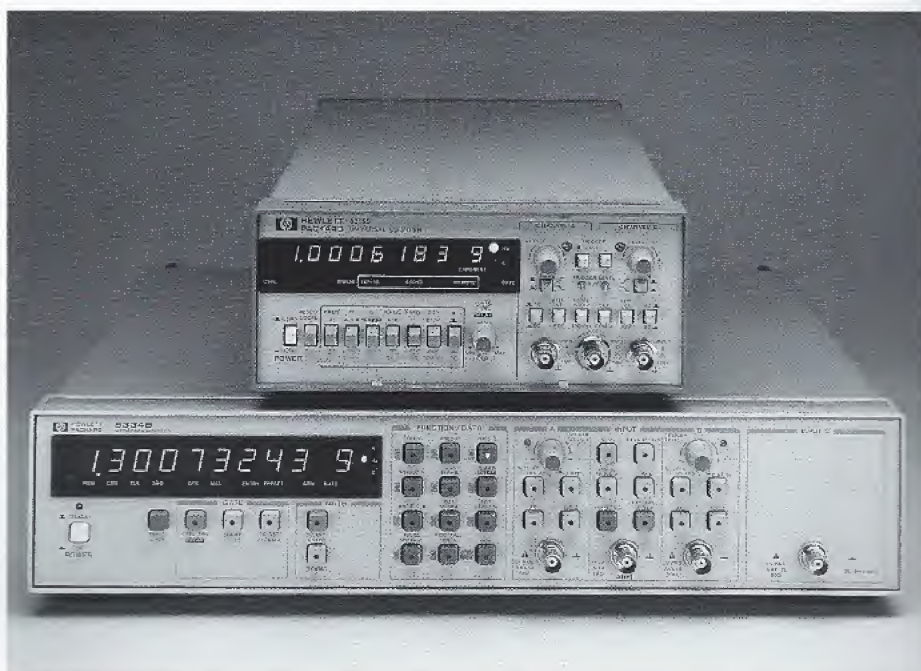
## High-performance HP 5334B

The HP 5334B offers pushbutton measurements such as rise time, fall time, pulse width, and ac/dc voltage. Also included are offset, normal, and average functions, and autotriggering and auto-attenuation for user convenience. Up to 140 unprocessed readings per second in an ATE application are possible.

The optional 1.3-GHz C channel and oven timebase (Option 030) make high-accuracy communication and navigation-frequency measurements convenient and easy to perform. For U.S. Air Force MATE applications, Option 700 is available for the HP 5334B.

The HP 5316B is \$1,475 and the HP 5334B is \$1,950. Option 700 is \$375 and Option 030 is \$550.

For more information, check **A** on the HP Reply Card.



The new HP 5316B and HP 5334B Universal Counters cost less than previous models, without sacrificing frequency or time-measurement capabilities.



## GENERAL-PURPOSE INSTRUMENTS



Additions to the HP PC Instrument family include a new dual VHF multiplexer module, two dc power supply modules, and a new software package.

## More modules, software for HP PC Instruments

Three new modules and a new software package are now available for HP's line of PC Instruments, a modular personal-computer instrumentation system designed for the test and measurement needs of technical professionals. Eleven modules are now available on the system.

HP PC Instruments works in a software-intensive environment along with the HP Vectra PC, the HP 9000 Series 200/300 engineering workstations, and the IBM PC, XT, or AT.

### Instrument modules

The HP 61019A Power Supply is programmable from 0 to 20V with a resolution of better than 5 mV. It has a fixed current limit of 1.5A at 5V, 0.9A at 10V, and 0.5A at 20V. Current readback to the controller has a resolution of better than 7.5 mA.

The HP 61025A Power Supply is programmable from 0 to 50V with a resolution better than 12.5 mV. The built-in current limit is fixed at 0.5A at 20V, 0.286A at 35V, and 0.2A at 50V. Current readback resolution is better than 2.5 mA. Both

power supplies have a programmable Enable/Disable feature to turn the output on or off.

The dual VHF multiplexer, HP 61020A, expands the number of channels that can be accessed by high-frequency PC Instruments modules. Each channel of the dual VHF multiplexer can switch four RF signal sources to one common port. It also can be used to switch a signal among four loads. The nominal channel impedance is 50 $\Omega$  and BNC connectors are used. The switching is accomplished by special VHF relays. Operation is specified from dc to 300 MHz.

### New software

The new HP 61061C software replaces the HP 61061B PC Instruments interface and system software for the HP Vectra PC, IBM PC, XT, AT, and the AT&T PC 6300. The HP 61061C, or Revision C.01 of the system software, has the following features:

- Language support for QuickBASIC versions 1.X and 2.X, Lattice® C versions 2.X and 3.X, and GW™ BASIC/BASICA version 2.0 or greater.
- Software support for all HP PC Instruments modules (HP 61010A to HP 61020A, and HP 61025A).
- The Human Interface Toolkit, a set of routines callable from all supported languages.

- A utility program that converts interpretive BASIC programs to QuickBASIC so that the compilation of HP PC Instruments applications can be done quickly and simply.

Kits are available to upgrade any earlier revision of HP PC Instruments system software (HP 61061AA, HP 61061BA, or HP 61061B, revisions A, A.01, B.01, B.02) to the latest revision C.01. This upgrade is not available on the HP 150 Touchscreen PC or HP 9000 Series 200/300 software.

Product specifications may vary in non-U.S. markets.

The HP 61019A and 61025A are priced at \$900 each. The HP 61020A is \$1,000. The HP 61061C is \$800, and the System Software Upgrade Kit is \$300.

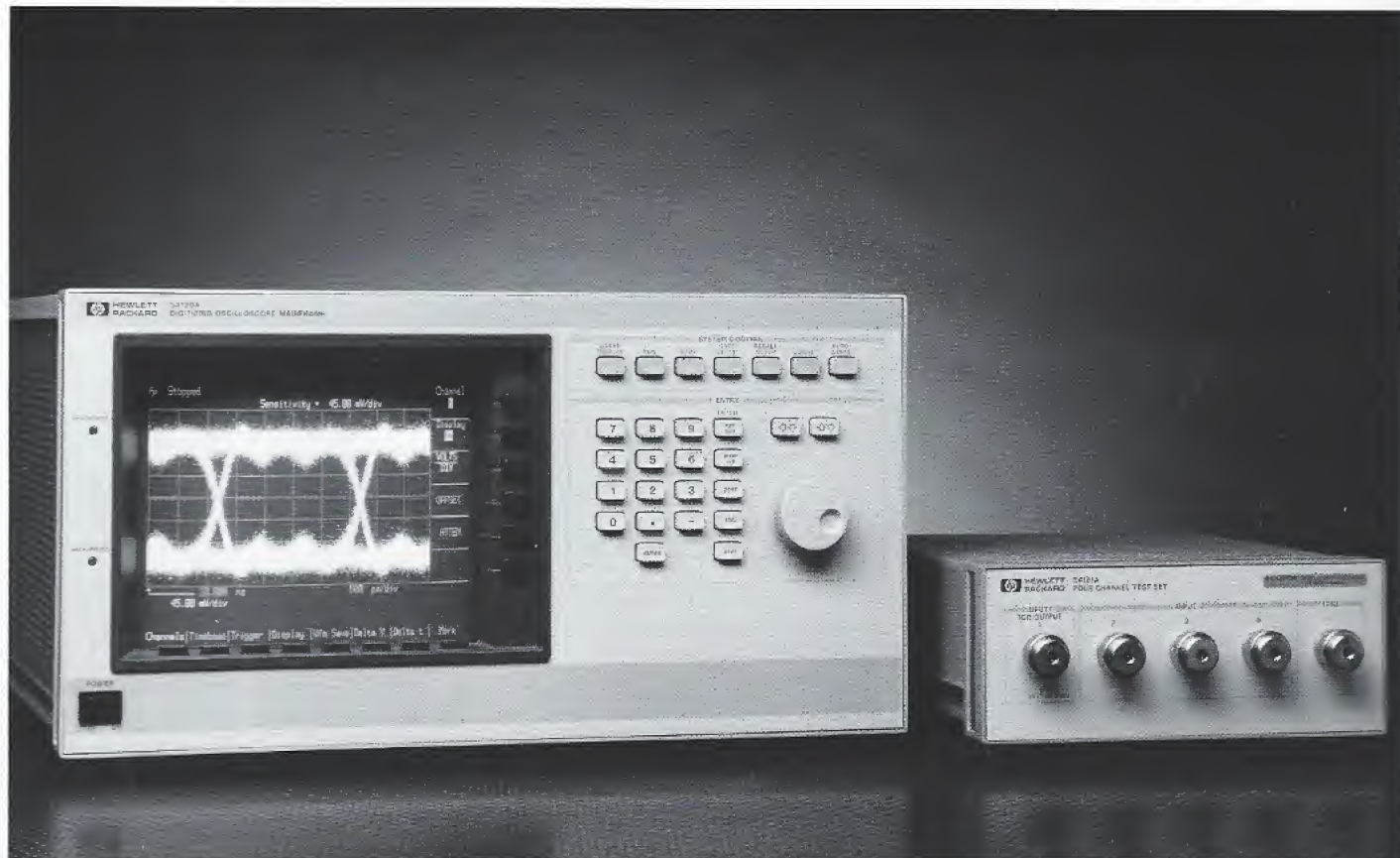
For more information, check on the HP Reply Card.

Lattice is a U.S. registered trademark of Lattice, Inc.  
GW is a U.S. trademark of Microsoft Corporation.



## GENERAL-PURPOSE INSTRUMENTS

# New digitizing scope makes picosecond measurements



The HP 54120T's time, voltage, and trigger stability increase measurement throughput.

The HP 54120T Digitizing Oscilloscope combines a 20-GHz bandwidth, a time-domain reflectometer, four input channels, and excellent stability in an easy-to-use instrument. All of the HP 54120T's front-panel functions are fully programmable, and you can automate your measurements using simple commands that make programming easy. Whether your application involves high-speed device and circuit characterization, microwave and RF measurements, or high-speed datacom analysis, this instrument will give you a new level of confidence while making measurements.

## Time-domain reflectometer (TDR)

The HP 54120T's built-in TDR enables you to make final adjustments on prototypes to compensate for hard-to-model parasitics. A TDR cursor measures reflection coefficient, impedance, and dis-

tance. A built-in step generator provides a signal source with 35-ps risetime and 1% flatness. The step generator can also send a known signal into a device under test (DUT), allowing the HP 54120T to measure propagation delay, gain or attenuation, and the effect of the DUT on pulse quality.

## Histograms and statistical analysis

The HP 54120T can display time and voltage histograms based on a user-specified sample size and time or voltage windows. In HISTOGRAM mode, one keystroke calculates the mean and standard deviation for the displayed histogram. You can measure jitter, noise, and eye openings with a method that can be quantified, precisely repeated, and automated.



### High-stability time, voltage, and triggering

The HP 54120T has 0.25-ps timing resolution and 10-ps accuracy. A pair of matched GaAs sampling diodes give it excellent dc stability.

The new scope can trigger reliably and repeatably on arbitrary, irregular signals, such as digital data streams and random logic pulses, and it does not require operator intervention when a change in signal repetition rate or frequency spectrum occurs.

### 12-bit A/D converters mean high resolution, low noise

A 12-bit A/D converter yields 250  $\mu$ V quantization levels. In averaged mode, the instrument has 32- $\mu$ V vertical resolution.

Matched IF filters provide a low noise floor. Low noise, combined with the instrument's high vertical resolution, give the HP 54120T a 1-mV/div sensitivity when data is expanded.

The HP 54120T has an easy-to-use, menu-driven user interface. Automatic instrument setup or hardcopy output to printers and plotters can be performed with a single keystroke.

A 9-inch functional color display allows you to see all data for a given channel in the same color. Similar associations are automatically made to distinguish voltage and time markers, parametric measurements, and error messages from other displayed data.

### 6-GHz probe

An optional probe kit, the HP 54006A, gives users access to circuit nodes without 50 $\Omega$  connectors. The kit includes 10:1, 500 $\Omega$  and 20:1, 1 k $\Omega$  resistive divider probes so that you can connect to signals with frequencies of up to 6 GHz in circuits with impedances that are not nominally 50 $\Omega$ .

The HP 54120T consists of the HP 54120A mainframe and the HP 54121A 4-Channel Test Set.

The HP 54120A is priced at \$11,525, the HP 54121A is \$16,325, and the HP 54006A is \$895.

For more information, check **C** on the HP Reply Card.

## GENERAL-PURPOSE INSTRUMENTS

### New fiber-optic test instruments

Two new stable LED sources are available for measuring insertion loss of passive optical components. The HP 8154B Option 001 uses an 850-nm LED; the HP 8154B Option 003 uses a 1550-nm LED. Output power is greater than -17 dBm and -23 dBm, respectively. The 1550-nm source features the same short-term stability of less than 0.02 dB over 12h as the HP 8154B Option 002 (1300 nm). Long-term stability over one year is better than 0.3 dB. These specifications include the optical connector. Values for the 850-nm version are less than 0.03 dB (short term) and less than 0.4 dB (long-term).

The HP 8158B Option 001 Programmable Optical Attenuator features individual calibration, a wavelength range from 600 to 1200 nm, a 60-dB dynamic range, and 0.01-dB resolution. The output also can be disabled. The HP 8158B handles all fibers with a numerical aperture of less than 0.3 because of its fiberless design. The insertion loss is very low, a typical value being 1.0 dB including the optical connectors. Designed especially for ATE applications, the new attenuator has a high programming speed and short settling time, typically 20 ms for a change in attenuation.

The HP 81520A Optical Head extends the measurement range of the HP 8152A Optical Average Power Meter to shorter wavelengths. The HP 81520A is calibrated individually between 450 nm and 1020 nm and offers a dynamic range of +10 dBm to -100 dBm (0.1 pW). Linearity is better than 0.05 dB (1%) between 10 and -80 dBm at constant temperature. Absolute accuracy (traceable to NBS and PTB) is better than 0.17 dB (4%).

The HP 81800AS Optical Power Splitter features a split ratio of approximately 1:10 in the wavelength range of 600 nm to 1200 nm. In combination with the HP 8152A Dual-Channel Optical Average Power Meter, the HP 81000AS ensures fast and reliable insertion-loss and long-term measurements on single-mode and multimode fibers with a numerical aperture of less than 0.3. The optical splitter is mode and polarization insensitive because of its fiberless design.

The HP 8154B with Option 001 and any connector option is \$3,050, and the HP 8154B with Option 003 and any connector option is \$6,000. The HP 8158B Option 001 and Diamond® HMS-10/ HP connectors are \$6,800. The HP 81520A is \$1,350. The HP 81000AS is \$1,350.

For more information, check **D** on the HP Reply Card.

Diamond is a registered trademark of Diamond SA.



HP now offers basic test instrumentation for all common wavelength ranges.



## GENERAL-PURPOSE INSTRUMENTS

## Low-priced, high-performance board test

The new HP 3065ST is a low-cost board-test system for testing VLSI, ASIC devices, and complex analog circuits. With this system, the price/performance ratio of the HP 3065 family is doubled. The HP 3065ST is designed for first-time board test users and others who expect their test needs to expand along with their products and technologies.

The HP 3065ST takes advantage of the proven test strengths of HP's 3065 board-test family to test analog, digital, or mixed-technology printed circuit boards. Digital in-circuit tests can be performed at rates of up to 2.5 MHz for testing SSI, MSI, and VLSI devices.

The new tester implements HP's industry-standard test capabilities for analog in-circuit and functional test, using the HP 3253A Analog Stimulus and Response Unit (ASRU). A full five-digit voltmeter and in-circuit stimulus and measurement hardware are fully integrated into the system's BT BASIC programming software.

For testing of application specific integrated circuits (ASICs), the HP 3065ST supports HP's Pattern Capture Format (PCF), a machine-to-machine format for capturing test vectors from CAE simulation systems. With PCF and the Vector Processor Card, the HP 3065ST can apply thousands of patterns to test custom devices.



Two test-development stations are included in the HP 3065ST's low price.

First-time test users will find the tester's library especially useful. It contains more than 4,000 digital tests, including coverage of 16 and 32-bit microprocessors, for automatic generation of digital tests. The system's powerful in-circuit program generator (IPG-II) automatically creates accurate 2, 3, 4, and 6-wire tests for analog components, and a complete shorts-and-opens test for the printed circuit board.

This multitasking controller allows users to develop tests without sacrificing

production throughput on the test station. The HP 3065ST can be expanded to provide more than 1,000 test nodes in the standard mainframe—more than 60% more nodes than other low-cost systems.

The HP 3065ST is priced beginning at \$95,000.

For more information, check **E** on the HP Reply Card.

## PC Instruments Applications Handbook now available

The *PC Instruments Applications Handbook* suggests ways that HP PC Instruments can be used to increase test and measurement productivity. Sections in the handbook include:

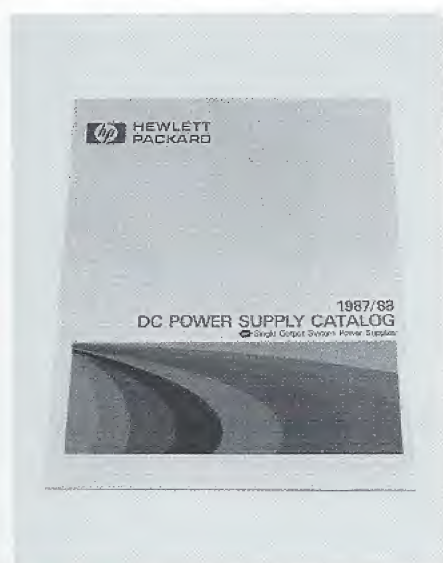
- Battery test
- Using the HP 61012A DAC as a programmable current source
- Optocoupler testing
- Semiconductor (diode/BJT/FET) testing
- Electromechanical device (relay) testing
- Using the HP 61017A Actuator as a switch matrix
- Measuring relative humidity
- Measuring the switching loss of a power transistor

The applications presented in the handbook have been verified and the results are shown. Most sections also contain detailed program listings and explanations. The applications illustrated in the handbook can be used standalone with some customization or used as building blocks to form part of a complete test system.

For a free copy, check **F** on the HP Reply Card.



## GENERAL-PURPOSE INSTRUMENTS



## New dc power-supply catalog

Choosing the right power supply for your application is easy with HP's new dc power-supply catalog. This 128-page catalog contains product descriptions, photographs, outline drawings, specifications, and prices for HP's complete line of power supplies covering the range from 10W to 11 kW. Products include:

- HP-IB-controlled single and multiple-output systems power supplies
- General-purpose lab and system power supplies
- Low-cost lab supplies
- Precision voltage and current sources

- High-power industrial supplies
- Multiprogrammers

One application section details several methods to control dc power supplies using the HP Interface Bus (IEEE 488). Another section covers power-supply ac and load connections.

For your free copy, check **G** on the HP Reply Card.

## Instrument Notes

**HP 41941A/B Impedance Probe Kit adds versatility to HP 3577A.** Although designed for use with the HP 4194A Impedance/Gain-Phase Analyzer, this probe kit works well with the HP 3577A Network Analyzer to make impedance measurements over a slightly reduced frequency range. The kit will accommodate measurements from 30 kHz to 100 MHz for impedances from less than 1 $\Omega$  to more than 10 K $\Omega$ . For more information on the HP 41941A/B, check **H**.

**New application note on effective bits in digitizing scopes.** Understand the critical vertical and horizontal resolution issues for digitizing oscilloscopes by reading "Voltage and Time Resolution in Digitizing Oscilloscopes" (AN-348). The application note discusses voltage resolution, digitizers and their limitations, how to improve voltage resolution (both in single-shot and repetitive measurements), and the relationship between sampling rate and analog bandwidth. Check **I**.

**Fiber-optic test-connector options.** Do you use your own cables for measurements? That's why HP provides FC/PC, DIN 47256, and ST connector options on its fiber-optic source, attenuator, and optical power-splitter family. You also can get the high-performance Diamond® HMS 10/HP connector and a comprehensive set of patch cords for this test equipment. The new connector options must be factory installed for the attenuators and optical power splitter, but for the sources, you can buy any of the connector options and exchange them yourself as needed. Contact your HP Sales Representative.

**New chip-component test fixture.** You can make highly accurate chip-component measurements easily with the HP 16034E Test Fixture. It can be used with all of the HP 4270 series of LCR meters and with the HP 4192A and 4194A Impedance Analyzers. You can use the HP 16034E up to 40 MHz and it only introduces slight additional error. Test devices are connected and disconnected easily by pressing a single loading lever. The HP 16034E is useful in lab or QA applications of a chip-component manufacturer or user. Contact your HP Sales Representative.

**New literature for HP 81810S IC Design Verification System.** You now can get four new pieces of literature on the recently introduced HP 81810S, designed for ASIC manufacturers and users. Check for all four items, including the overview brochure, hardware and software technical data sheets, and the ordering and configuration guide.

**Special HP 6632/33/34A HP-IB Power-Supply promotion.** There is still time to participate in the special 100W power-supply promotion that ends July 31. You can buy single trial units of any of these supplies at more than a 30 percent discount. Each of these new units combines a dc power supply (20, 50 or 100V), an HP-IB interface and programmer, and a DVM in one compact, easy-to-integrate box. With these supplies you can simplify cabling, save rack space, and reduce system noise. Call your local sales office.

**Buy three "basic tools" by telephone, get free HP-28C (U.S. only).** If you order any three of 22 basic electronic measurement tools (counters, DMMs, function and pulse generators, and power supplies) by phone before December 15, 1987, we will send a free HP-28C Scientific Calculator with the order. Details about the program and the new easy telephone ordering are contained in a 6-page mini-catalog you can obtain by checking **K**.



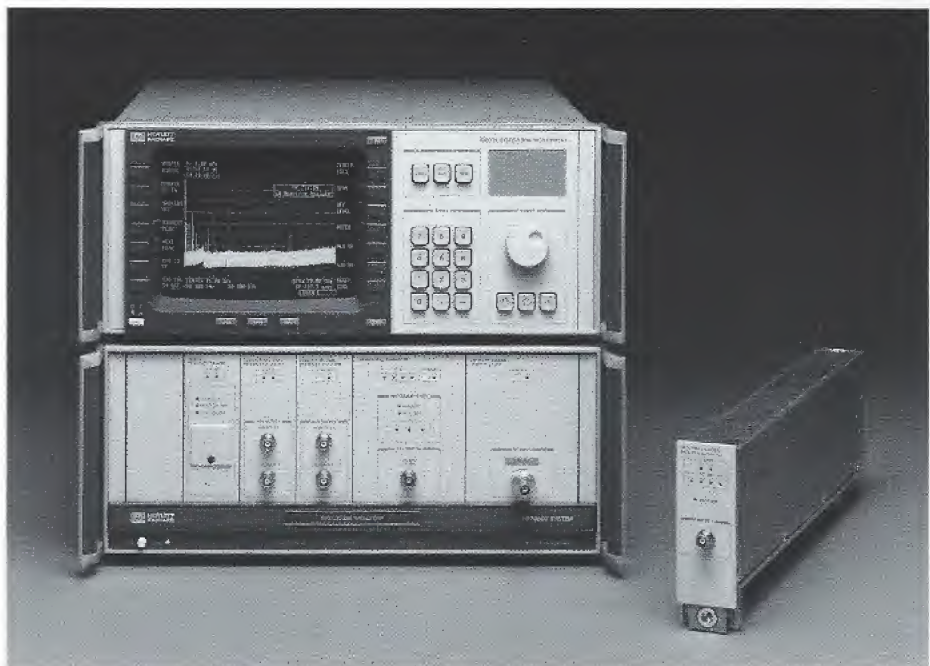
## RF &amp; MICROWAVE

## New spectrum analyzer sweeps 100 Hz to 22 GHz

HP's first 100-Hz-to-22-GHz, fundamentally-mixed spectrum analyzer is now available in the HP 70000 series of modular measurement products. The HP 71210A Spectrum Analyzer is a fully-programmable instrument and overcomes the measurement degradation that occurs in standard harmonically-mixed, swept spectrum analyzers. The HP 70908A, a front-end module designed for the system, contributes:

- Fundamental mixing for better sensitivity and greatly increased dynamic range.
- A dynamically-tracked preselector that is always peaked to the tuned frequency of the spectrum analyzer, so measurements are made without the use of time-consuming preselector-peaking routines.
- A solid-state switch that allows a continuous sweep across the 100-Hz-to-22-GHz band. Switching from RF to microwave is rapid and there are no mechanical parts to wear out.
- A balanced microwave mixer. With the elimination of harmonic mixing, the biased mixer is replaced by a balanced mixer optimized for flatness, sensitivity, voltage standing-wave ratio (VSWR), and dynamic range.

The extremely high sensitivity of the HP 71210A ( $-133$  dBm at 22 GHz, 10-Hz bandwidth) permits detection of weak signals in surveillance, spurious signal



The HP 71210A is well suited for defense and commercial ATE, manufacturing ATE, and benchtop R&D applications.

check, and noise measurements. Since wider bandwidths can be used, sweep times are reduced and measurement speed increases dramatically. Third-order intercept (TOI) is high, specified at  $+7$  dBm at 22 GHz, and frequency response is  $\pm 2$  dB at 25°C from 2.7 to 22 GHz.

Such high sensitivity aids detection and analysis of pulsed signals. The ability to sweep with larger resolution bandwidths dramatically increases the speed of, for example, production testing that measures spurious signals or harmonics at microwave frequencies. And with dynamically peaked preselection across the

band, the HP 71210A significantly improves the speed and accuracy of power measurements.

The HP 71210A is priced at \$70,200. The HP 70908A is \$35,200. For more information, check **L** on the HP Reply Card.

## Front panel and HP-IB control improves modular signal generator

The HP 8660D Synthesized Signal Generator has been improved with a new front panel and a microprocessor for simplified HP-IB control. This enhancement is compatible with all HP 8660A/B/C HP-IB and BCD programming codes.

The HP 8660D offers 2.6-GHz fre-

quency coverage with eight different plug-ins. Modulation capabilities include FM rates to 1 MHz, phase modulation rates to 10 MHz, AM, and external pulse. Single sideband phase noise is



Retrofit your HP 8660A/C with a new front panel and digital control unit.

typically less than  $-90$  dBc 1 kHz from the carrier. Spurious signals are less than  $-80$  dB.

Other hardware changes include a new high-reliability power supply for the mainframe, and RF plug-ins, which add a high-reliability RF attenuator and driver circuitry. The high-stability time base, HP-IB interface, and 50-to-400-Hz line operation are now offered as no-cost options.

The HP 8660D base price is \$14,310. The plug-ins range from \$715 to \$10,095. For more information, check **M** on the HP Reply Card.



## RF &amp; MICROWAVE

## New moderately priced microwave network-analyzer system



The HP 8510E Network Analyzer is a complete 20-GHz measurement system consisting of the HP 8510B, an s-parameter test set, broadband sweeper, and accessories.

The new HP 8510E is a complete measurement system based on the recently introduced HP 8510B Microwave Network Analyzer. The system is priced below similar products with the same capability.

The HP 8510E measures magnitude and phase of transmission and reflection coefficients, and group delay over the frequency range from 45 MHz to 20 GHz. Features include:

- Greater than 100-dB dynamic range (above 200 MHz)
- Resolutions of 0.001-dB magnitude, 0.01-degree phase, and 10-ps group delay
- Error-corrected measurements at 201 frequency points in less than 500 ms
- Measurement precision derived from an effective directivity greater than 44 dB and effective source match greater than 30 dB.

The complete system contains the HP 8510B Network Analyzer, HP 8514B S-Parameter Test Set, HP 8350B/83592A Option H10 Sweep Oscillator (45 MHz to 20 GHz), and 3.5-mm calibration and cable kits. Options are available to substitute the HP 8341B Synthesized Sweeper for the sweep oscillator (Opt. 001), add step attenuators and bias tees to the test set (Opt. 002), and add time-domain capability to the HP 8510B (Opt. 010).

The HP 8510E measurement system is priced at \$80,700. Opt. 001 is \$17,200, Opt. 002 is \$6,500, and Opt. 010 is \$9,800. For more information, check **N** on the HP Reply Card.

## Modular digitizer increases performance of HP 70000 system

The HP 70700A Modular Digitizer packs a typical "rack-and-stack" instrument into a convenient, 1/6-mainframe-width module for the HP 70000 Modular Measurement System. The digitizer not only provides 20 megasample/second, 10-bit waveform analysis, but also adds new capabilities to a spectrum analyzer.

### Increase spectrum-analyzer performance

This new digitizer increases the speed at which analog information is converted to digital form for processing by microprocessors or computers. Slaved to a modular spectrum analyzer, the HP 70700A enables faster sweeps and digitization of the analyzer's full bandwidth as well as rapid display and processing of digital information.

In the frequency domain, digitized sweeps can be as fast as 15 milliseconds. Start-to-stop frequency-domain sweeps are the fastest available from any HP spectrum analyzer. Full-resolution, time-domain sweeps are as fast as 80 microseconds, limited only by the 3-MHz bandwidth of the spectrum analyzer. These capabilities are valuable in applications such as pulsed signal analysis.

### Create a waveform-analysis system

Independent of the spectrum analyzer, digitizer modules can be combined to create a multichannel, waveform analysis system. Up to four modules can operate manually, and up to eight can operate under automatic control. A fully programmable, 8-channel system fits into one mainframe.

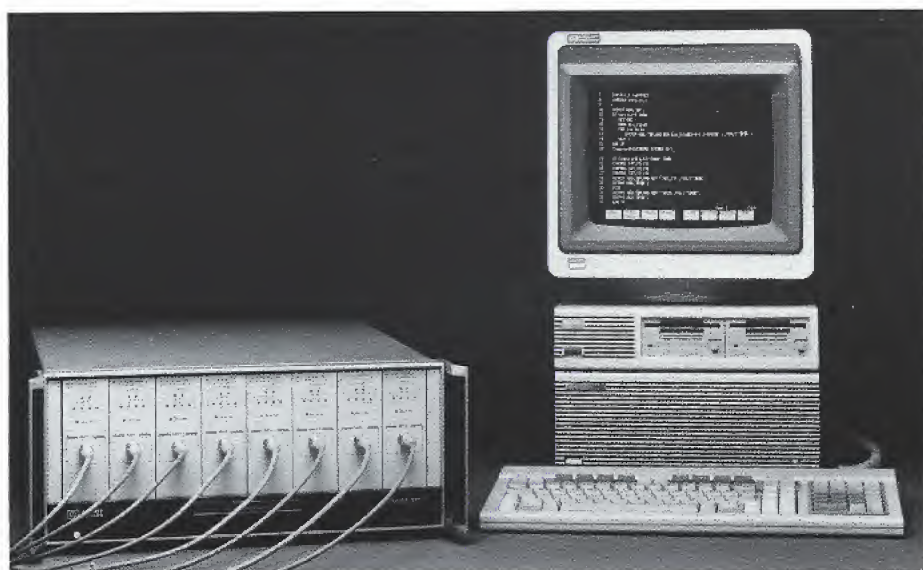
Configured as a stand-alone benchtop instrument, the HP 70700A offers up to four channels, 256K-word "deep memory", built-in functions such as Auto-Scale, Measure All, Averaging, FFT, Markers, Trace Zoom, and Trace Math, and  $\pm 1\%$  gain and offset accuracy.

The Random-Event Capture function enables capture of several hundred trigger events with pre- and post-trigger data around each. Events are time-stamped to 50-ns precision. No re-arm time exists between events, so no event is missed. Memory is dual-ported so that events can be examined while the measurement continues.

As a waveform analyzer, the HP 70700A can be used for mechanical analysis such as vibration testing, and for multichannel operations such as ballistics testing.

The HP 70700A Modular Digitizer is \$7,500.

For more information, check **O** on the HP Reply Card.



Random-event capture makes HP's new digitizer especially useful in applications such as radar and switched-power-supply and oscillator testing.



## RF &amp; MICROWAVE

## New application note on low phase-noise signal generators

Application Note 283-3 describes how the HP 8662A and HP 8663A Synthesized Signal Generators achieve low, close-in phase noise.

The note tells how to apply this phase-noise performance to solve problems that commonly arise in RF and microwave phase-noise measurements, receiver testing, and local-oscillator substitution.

For a free copy of Application Note 283-3, check **P** on the HP Reply Card.

## On-site calibration of scalar network analyzers



You can reduce downtime and calibration time substantially with the new HP 11613B Calibrator.

The HP 11613B Calibrator allows on-site verification and maintenance of the internal calibration data stored in the HP 8757A and 8756A Scalar Network Analyzers. For the analyzer to meet its power and dynamic accuracy specifications, this calibration must be updated periodically. With the HP 11613B calibrator, these recalibrations can be performed on-site in a matter of minutes. The previous recalibration procedure was to send the analyzer to an HP service center.

When the HP 11613B is used with an HP 8756A and an HP 9000 Series 200 or 300 Computer, an HP 98622A GPIO card is required. With an HP digital voltmeter, the HP 11613B can also be used with HP 8755A/B/C Scalar Network Analyzers.

The HP 11613B is \$950 and the HP 98622A is \$355.

For more information, check **Q** on the HP Reply Card.

## RF/Microwave Notes

**Components.** HP 8494H Option H63 is a custom variation of our coaxial step attenuator that covers dc to 10 GHz, in 0.5 dB steps to 11.5 dB.

The HP 33323K Option K01 is a custom modification of our longlife step attenuators that replaces all the pads with connectors. It makes a 1-pole, 5-throw coaxial switch that works to 26.5 GHz in a compact package. Isolation ranges from 40 dB at dc to 25 dB at 26.5 GHz.

The new HP 11742A Blocking Capacitor operates from 10 MHz to 26.5 GHz and uses APC-3.5 connectors. It's excellent for use with the wideband oscilloscopes and for dc bias blocks in transistor fixturing.

**Signal generators.** RF and microwave engineers should consider the HP 8770A Arbitrary Waveform Synthesizer (AWS) more of a signal simulator. We now have some powerful environment simulation results for applications such as modern radar/EW signals. We use two synchronized AWSs feeding the new HP 8780A Vector Signal Generator. One AWS feeds the I-channel input and the other AWS feeds the Q-channel. This combination, while not inexpensive, builds modulation simulations with software flexibility and excellent signal power and complexity. Now all new HP 8770As can be synchronized with each other to support this type of application.

Some microwave automatic-test programs require that classified parameters and data values be secure from casual observation. We have documented some techniques and features for a number of our products to help deal with this problem. These models are the HP 8350B, 8340B, and 8341B sweepers and the HP 8756A, 8757A, 8753A, and 8510A network analyzers. Call your HP Sales Representative for more details.

**Logistic support.** If you deal with instrument identification and U.S. National Stock Numbers, HP has a free 100-page Logistic Data Book that makes the job easier. It cross-references the NSNs, HP stock numbers, and military nomenclature for HP products, past and present.

**Spectrum analysis.** USAF contractors want all programmable instrumentation to be MATE (Modular Automatic Test Equipment) compatible. The HP 70590A-H69 Test Module Adapter now links the HP 71000 Series Modular Spectrum Analyzer System to the MATE environment. The firmware allows the operator to switch from CIIL language back to native code with a single command.

Electronic smog hurts us all as shown by snow on the TV and buzzing on the radio. EMI antennas and leakage "sniffers" for the HP 85685A Spectrum Analyzer Preselector are quite specialized, so we have assembled five kits as standard products called HP 11965X.

A new harmonic-mixer product note (PN 11970/71) explains step-by-step operation procedures with interconnection diagrams, accuracy considerations, mm-wave band coverage, signal identification methods, and the use of biased-type non-HP mixers. Call your HP Sales Representative for a copy.

Do in-depth testing of FM, PM, AM, SSB, and cellular radios with new HP 11805A software packages for the HP 8953A Radio Test System. For example, you can cover cellular AMP, EIA-800, TACS, and TACS with AMPS Bus. All software packages test to recognized production standards. Also, Option 101 provides for out-of-channel testing for Extended North American FM tests; Option 201 is for Extended European PM tests.

### New Literature

Title	Check on reply card
Introductory Operating Guide to the HP 8980A Vector Analyzer (PN 8980A-1)	<b>R</b>
Introducing the HP 8590A Spectrum Analyzer (PN 8590A-1)	<b>S</b>
Principles of microwave connector care for higher reliability and better measurements (AN 326)	<b>T</b>
Millimeter-wave instrumentation brochure (mm-wave selector)	<b>U</b>



## COMPUTERS/CONTROLLERS

## New tape drives unite high performance, compact design, low price

Two new high-performance 1/2-inch tape drives are now available, replacing HP's current 1/2-inch tape drive products.

The HP 7980A is a 6250/1600 cpi, 1/2-inch magnetic tape drive designed for systems with 400 megabytes or more of disc backup requirements. This drive replaces the HP 7978B. The HP 7979A is a 1600 cpi only, 1/2-inch magnetic tape drive providing an industry-standard solution for systems with disc backup requirements of between 100 and 500 megabytes. Although the HP 7979A replaces the HP 7974A for 1600 cpi applications, the HP 7974A will continue to provide data interchange for systems requiring 800 cpi compatibility.

Both drives are priced less than their predecessors and support IBM/ANSI-compatible formats.

Important features of the new tape drives include:

- **Autoload.** An autoload feature improves operator efficiency. Standard tape reels ranging in size from 6 to 10.5 inches are automatically positioned and threaded.
- **Compact design.** Drive mechanisms yield a small form factor. Enough space has been reserved in the rack for one additional mechanism.
- **Low maintenance.** Monthly maintenance cost has been reduced and periodic maintenance is not required.
- **Improved performance.** Read and write operations are performed at 125 ips. A large 512K-byte buffer assists the immediate-response and read-ahead software features. Available with HP 3000 systems, the new TurboSTORE backup program allows simultaneous reading or writing to multiple tape devices.

The HP 7980A is priced at \$22,400 and the HP 7979A is \$13,000.

For more information, check **V** on the HP Reply Card.



The new HP 7980A provides high-performance backup for systems with 400 megabytes or more.

## Low-cost tablet supported by AutoCAD, VersaCAD

Now you can use HP's high-resolution, low-cost HIL tablet (HP 45911A) for your HP PC-CAD system. AutoCAD® and VersaCAD® now fully support HP Vectra PC tablets. And HP's tablet has a small footprint, offers high resolution (1,200 lines per inch), and is easy to use.

You can get AutoCAD's HIL-driver for the tablet with Version 2.52 and above. Earlier copies of 2.52 may not have the HIL drivers, so check with your dealer before purchase. If you already have AutoCAD on an HP Vectra PC, you can get driver update discs from authorized AutoCAD dealers.

VersaCAD offers 2D, 3D, and solids-modeling packages. It's well suited for ME applications, where use of the HP tablet improves input speed. Version 5.1 of VersaCAD has a driver for the HP 45911A tablet and the HP 46060A mouse.

The new tablet works with HP Vectra PCs and HP 150 systems.

The HP 45911A is priced at \$499. The HP 46060A is \$148.

For more information, call your local HP Sales Office.

AutoCAD is a registered trademark of Autodesk, Inc.  
VersaCAD is a registered trademark of T&W Systems, Inc.



## MORE PRODUCTS

## Seven more component families

The new HSMX-3131/3635 transistors and the HSMP-38XX series PIN diodes expand HP's surface-mount product line. Both families of parts are in SOT-23 packages and are used in high-volume, automated-assembly applications. The HSMX-3131 is a general-purpose transistor with a high gain of 14 dB at 1 GHz; its noise figure is typically 1.8 dB at 1 GHz. The HSMX-3635 is a low-noise, high-gain transistor, with a typical gain of 15 dB and a noise figure of 1.4 dB at 1 GHz. These transistors are ideal for use in consumer electronics, communications equipment, and instrumentation.

The HSMP-38XX series of PIN diodes is primarily used in attenuators, switches, phase shifters, limiters, duplexers, and pulse or amplitude modulators. Product features include low series resistance, low capacitance, low harmonic distortion, and wide dynamic range. Check **W** for more information on the HSMX-3131/3635 and HSMP-38XX series.

### New optocouplers

For systems that require high-voltage isolation and low-input currents, HP now offers the HCPL-2211/12/32. These eight-pin optocouplers provide a high common-mode rejection (CMR) of 5000V/ $\mu$ s at 300V peak. The HCPL-2211 and HCPL-



The HDSP-2111/12 displays are excellent in applications such as avionics, medical, telecommunications equipment, computer products, and office and industrial equipment.

2212 are single-channel devices; the HCPL-2232 is a dual-channel device. All three devices permit design flexibility because of their low-input current (only 1.8 mA) and wide supply voltage range (4.5V to 20V). Typical data rate is 5 Mbaud.

Four new eight-pin hermetic optocouplers, the HCPL-54XX series, have been released for use in high-reliability systems.

The HCPL-54XX series is in full compliance with MIL-STD-883 Class B requirements and offers what HP believes is the fastest performance available today by a hermetic logic-gate optocoupler. The HCPL-5400 and the MIL-STD-883 Class B compliant HCPL-5401 are single-channel devices, while the HCPL-5430 and Class B compliant HCPL-5431 are dual-channel devices. For more information on the HCPL-2211/12/32 and the HCPL-54XX series, check **X**.

### New LED lamps, displays

A new family of infrared LED lamps is now available. Optimized for maximum quantum efficiency at a peak wavelength of 940 nm, the lamps come in two package styles, T-1 (HEMT-1001) and T-1 3/4 (HEMT-3301). Also available are two new families of rectangular LED indicators in four bright colors, the HLMP-SX00 series rectangular lamps and the HLMP-TX00 series light bars.

The HDSP-2111/12 intelligent alphanumeric displays feature a 5-by-7 dot-matrix font in an eight-character string. The standard 0.6-inch, dual-in-line 28-pin package is available in two colors, yellow (HDSP-2111) and red (HDSP-2112). Check **Y** for more information on the infrared LED lamps and the alphanumeric displays.

These products are available from the HP Component sales force as well as HP authorized distributors.

## New digital-transmission tester for Bell network

A new digital-transmission test set designed for use on Bell-standard microwave radio systems is available in two versions, the HP 3789A and B.

The HP 3789A includes the basic pattern-generation and error-measurement capability needed for performing short-term commissioning, installation, and maintenance tests on DS3 transmission networks. The HP 3789B is a more powerful tester that performs nonintrusive error and jitter measurements on both DS3 and DS1 signals.

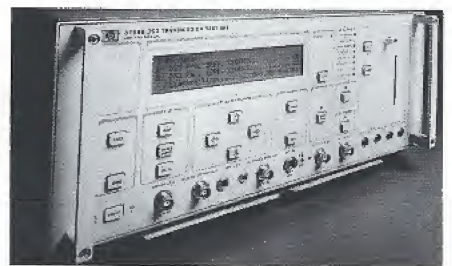
Both versions include: built-in transmitter, remote operation, "scan mode" testing of multiple DS3 inputs, optional built-in printer, and optional dc operation from station batteries.

In addition, the HP 3789B features:

- drop and measurement of DS1 digroups from a DS3 access point
- simultaneous real-time display of two measurement results
- access to DS1 digroups for testing PCM voice or 64-kbit/s data
- results storage on optional 3½-inch disc drive

The HP 3789A is \$8,300 and the HP 3789B is \$11,000.

For more information, check **Z** on the HP Reply Card.



Both DS3 digital-transmission facility providers and equipment manufacturers will benefit from the new transmission test set.

 **HEWLETT  
PACKARD**